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File Code: 3420 **Date:** October 21, 2003
Route To:

Subject: Spruce Beetle at Snowbowl Ski Area (peaksrd)

To: District Ranger, Peaks RD, Coconino NF

We (Arizona Zone of Forest Health Protection) have been working with your staff silviculturist, Jim Rolf, regarding spruce beetle, *Dendroctonus rufipennis*, activity and suppression treatments at the Snowbowl Ski Area. During August 2003, we conducted ground surveys to identify infested spruce trees and review suppression activities. This letter summarizes survey results and observations regarding spruce beetle activity in this area. We provide a background of spruce beetle activity, a description of past and current suppression projects, and a discussion of possible future actions.

Background

In the fall of 1999, a windstorm caused damage to spruce-fir stands on the San Francisco Peaks (**Figure 1**). The majority of this damage was in the form of causing spruce trees to blow over and was primarily spread across 25 acres within the Snowbowl Ski permit area. Spruce beetle is well known to infest trees that have been blown over. Surveys in 2000 and 2001 indicated spruce beetle activity had occurred in essentially all the wind-thrown spruce.

A survey in the fall of 2001 found several standing infested spruce. A total of 161 infested spruce trees were tallied within the blowdown area adjacent to the chairlift below Midway. These findings indicated that some of the brood developed and emerged within a one-year time span. At this time, most of the infested trees were limited to within the areas of blowdown; that is, beetles had not yet expanded to adjacent stands.

Based on walk-through surveys, stands adjacent to blowdown area seemed to be at moderate-high to high risk. There are numerous spruce greater than 16 inches diameter at breast height, and spruce composition and basal areas are high. This combination of stand characteristics with the presence of increasing beetle populations indicated that an outbreak was likely.

Past suppression efforts and current situation

Throughout late summer of 2002, we conducted ground surveys to identify newly infested spruce trees. More than 700 infested spruce trees were identified and marked with flagging. In addition, small pockets of new blowdown were discovered. Brood in many of the infested trees at lower elevations (i.e., forested areas F and I) had already developed to the pupa or callow adult stage, indicating that they will complete their life cycle in 1 year. Brood in infested trees at higher elevations (i.e., above Midway) were still in the larval stage, suggesting that they will have a 2-year life cycle. In addition to surveying within the permit area, we ran a 2-chain wide survey in the Kachina Wilderness adjacent to the Upper Ridge ski run (W1 in ***Figure 1***). Only 8 infested spruce trees were found in approximately 8 acres surveyed, indicating that most of the infestation was limited to the permit area.

In 2001, the Peaks RD contracted with the Northern Arizona Conservation Corps (NACC) to begin treating infested blowdown by limbing, bucking, and scorching the outer bark with torches. Due to the narrow window of favorable weather to complete this treatment, only a small percentage of the blowdown was treated.

In 2002, the District contracted NACC to treat standing infested trees by felling and peeling through the use of a "log wizard." Removing the bark results in the cambium drying to the point of becoming a non-food resource, causing the developing brood to desiccate and die. The use of a log wizard permits a wider window of opportunity for treatment compared with burning. However, because the District did not receive funds until mid-April and because of chainsaw restrictions and then forest closures, this treatment did not begin until August. From August through September, approximately 150 trees were felled and peeled. Forested areas C, E, F, and G were partially or completely treated.

In 2003, the Peaks RD also contracted NACC to treat standing infested trees by felling and peeling through the use of a "log wizard." From July through September, approximately 340 trees were felled and peeled. Forested areas A, C, and F were partially or completely treated. Funding delays and chainsaw restrictions due to fire risk prevented the felling and peeling treatments from starting until late July, and weather delays prevented the completion of treatments. Thus, some spruce beetle emerged from previously infested trees before treatments took place, and not all infested trees were treated. In August 2003, personnel from our office identified 289 newly infested spruce trees within forest areas A, C, and F (***Table 1***). Limited resources and time prevented other areas from being surveyed at that time. During a recent visit to Snowbowl, I observed additional recent attacks in areas G and I.

Table 1. *Number of spruce beetle-infested trees and average diameter at breast height (DBH) within forested islands at Snowbowl Ski area identified in August 2003. See Figure 1 for location of survey areas. Areas not yet surveyed are omitted from table.*

	Survey Area			
	A	C	F	TOTAL
Average DBH	18.7	19.7	16.4	18.3
Number of trees	64	47	42	289

In addition to the felling and peeling treatment, the anti-aggregation pheromone for spruce beetle, MCH, was deployed on approximately 50 acres of forested area within forested areas A, B, C, H, and W1 during the summer of 2003 (see ***Figure 2***). The use of these pheromone treatments reduced new attacks within area A by nearly 75 percent. In other areas treated with MCH, there were similar reductions in the number of newly infested trees.

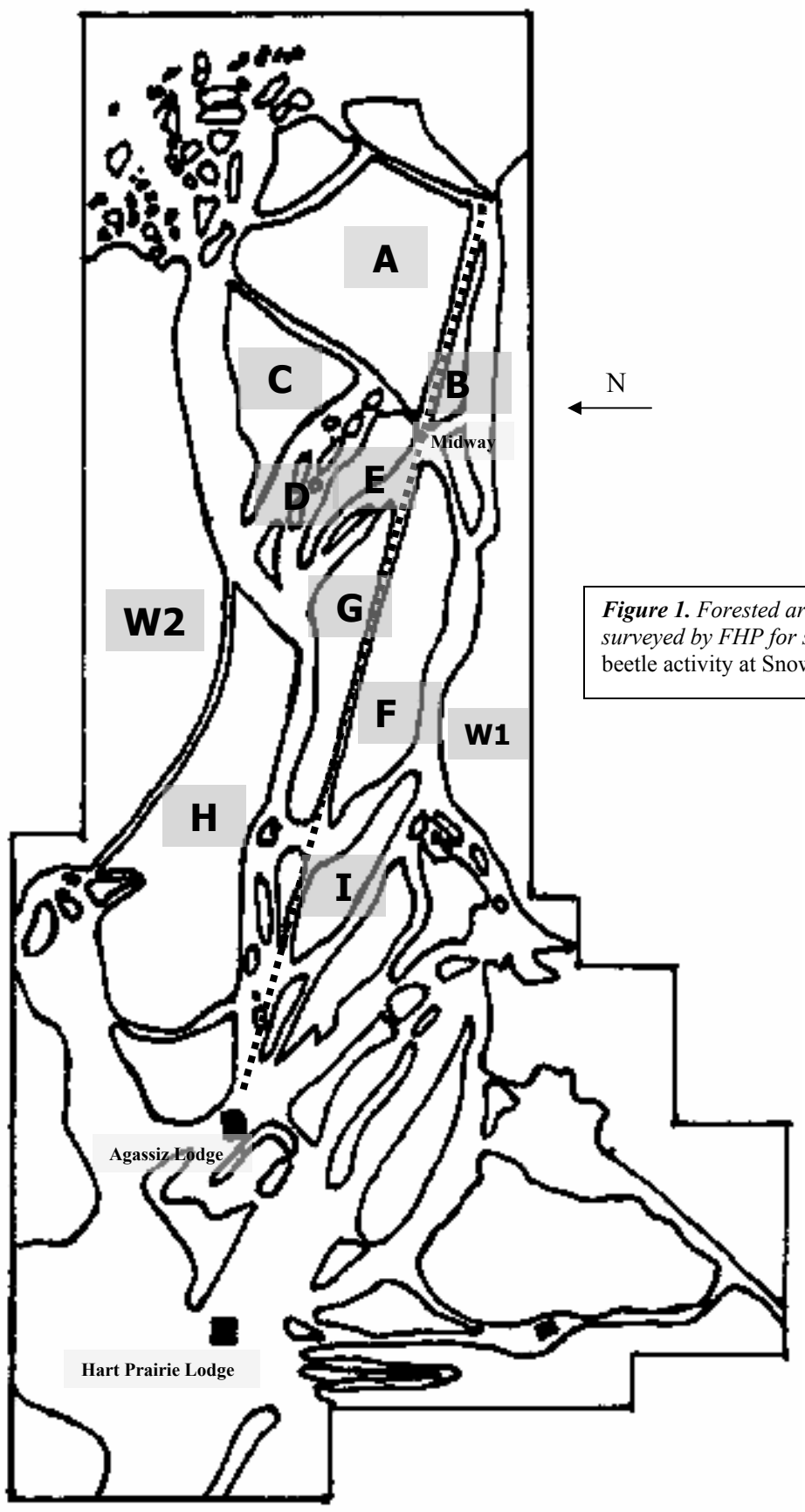

Figure 1. *Forested areas surveyed by FHP for spruce* beetle activity at Snowbowl.

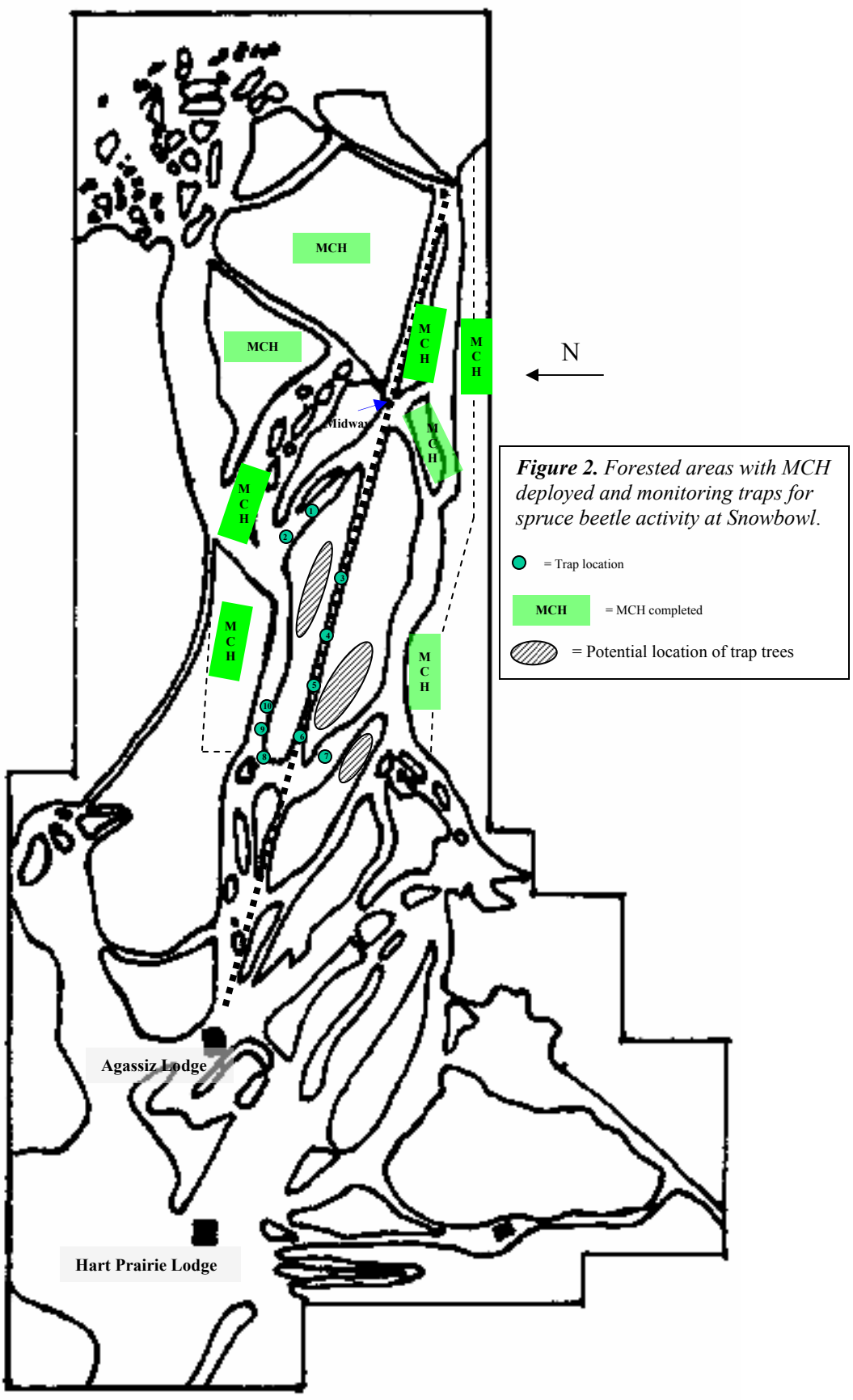

Figure 2. *Forested areas with MCH deployed and monitoring traps for spruce beetle activity at Snowbowl.*

Future situation

In last year's site visit report, we stated that 2003 would be the "make or break" year, in which either the beetle is contained within the permit area or expands to the wilderness. It appears that treatments implemented in 2003 have continued to contain most of the spruce beetle infestation, and the number of newly infested trees was reduced. However, these integrated treatments need to continue in 2004, as bark beetle suppression and prevention treatments generally take several years to complete. Additional surveys and treatments will likely be necessary beyond 2004.

Based on a post-treatment meeting on September 30, 2003, that was attended by Jim Rolf, Patty Ringle, NACC personnel and myself, several conclusions were drawn. First, a crew of 2 to 3 people surveying ahead of the fellers and peelers enhanced the efficiency of felling and peeling treatments. The surveyors flagged currently infested trees and removed flagging from trees in which beetles had already emerged. This type of teamwork should continue in 2004 when felling and peeling occurs after beetles have begun to emerge. Training of 1-3 people on the NACC crew that would be dedicated to surveying will greatly facilitate this work. Our office can provide this training.

Second, we discussed the idea of integrating a "trap tree" approach with other treatments to reduce the local population of spruce beetle. It was agreed that, because infested trees near the chairlift cannot be felled due to the risk of damaging the lift and because several factors have prevented infested trees from being treated prior to beetle emergence, this additional treatment is warranted. Trap trees are green trees with a dbh greater than 12 inches that are felled before beetle flight initiates in late May or early June (Holsten *et al*., 1999). Trap trees can absorb up to 10 times the number of spruce beetles that a standing tree will absorb. Once infested, trap trees must be treated on site or removed. Trap trees shaded from direct sunlight attract the most beetles and, therefore, must be located within a forested area. Spruce beetles attack cool, shaded portions of the trap tree boles. Felled trees should not be delimbed. Limbs on the upper side of the bole provide shade, while limbs on the underside permit the beetles to colonize the underside of the bole by keeping it off the ground. Past ratios of trap trees to infested standing trees have ranged from 1:2 to 1:10. Current ratios vary with the size of the green trees to be felled as traps compared to the number and size of infested trees and the existing beetle population. Potential locations for trap trees are shown in the hatched polygons in ***Figure 2***. Based on the number of currently infested trees within these locations, we estimate that 50 trap trees would be needed to absorb most of the nearby spruce beetle.

Third, we discussed the *ideal* schedule for successfully completing suppression activities to reduce spruce beetle populations and protect spruce trees within the Snowbowl area. Consensus was reached on the following schedule:

1. Felling and peeling treatments should take place at two times during the year. The first seasonal treatments would occur in late spring until mid-June. The second treatment period would start in September through October. The reasoning for this is that over the last 3 years, both fire restrictions (typically mid June through early July) and weather delays (mid July through early September) have hampered treatments from efficiently being implemented. Because broods develop faster at lower elevations, these areas should be treated as soon as weather permits in the spring of 2004.

2. Trap trees would be felled in mid May prior to beetle flight. Trap trees would be peeled using log wizards after beetle flight is completed (early September). Monitoring of beetle flight will be completed using baited Lindgren funnel traps. Monitoring traps should be in place by mid-May until early September.

3. MCH should be deployed in a grid fashion through areas identified in ***Figure 2*** before the first of June. The NACC crew could assist in the stapling of MCH bubble capsules, as they have two State of Arizona certified pest applicators. Our office will supervise handling and deployment of MCH.

Funds may be available for FY2004 from Forest Health Protection for suppressing spruce beetle populations at the Snowbowl Ski area. Requests for these funds should be in no later than October 18, 2003. If you have any questions regarding my assessment of current bark beetle activities within the project area, its potential effect on residual standing trees, or my recommendations, please let me know. I can be reached at (928) 556-2074.

/s/ Joel D. Mcmillin
JOEL D. McMILLIN
Entomologist, Forest Health,
Arizona Zone

cc: James Rolf, Patricia Ringle, Rodger Zanotto, Michael Manthei, John Anhold, Debra Allen-Reid, Leonard Lucero, Gene Waldrip, Mailroom R3 Coconino

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